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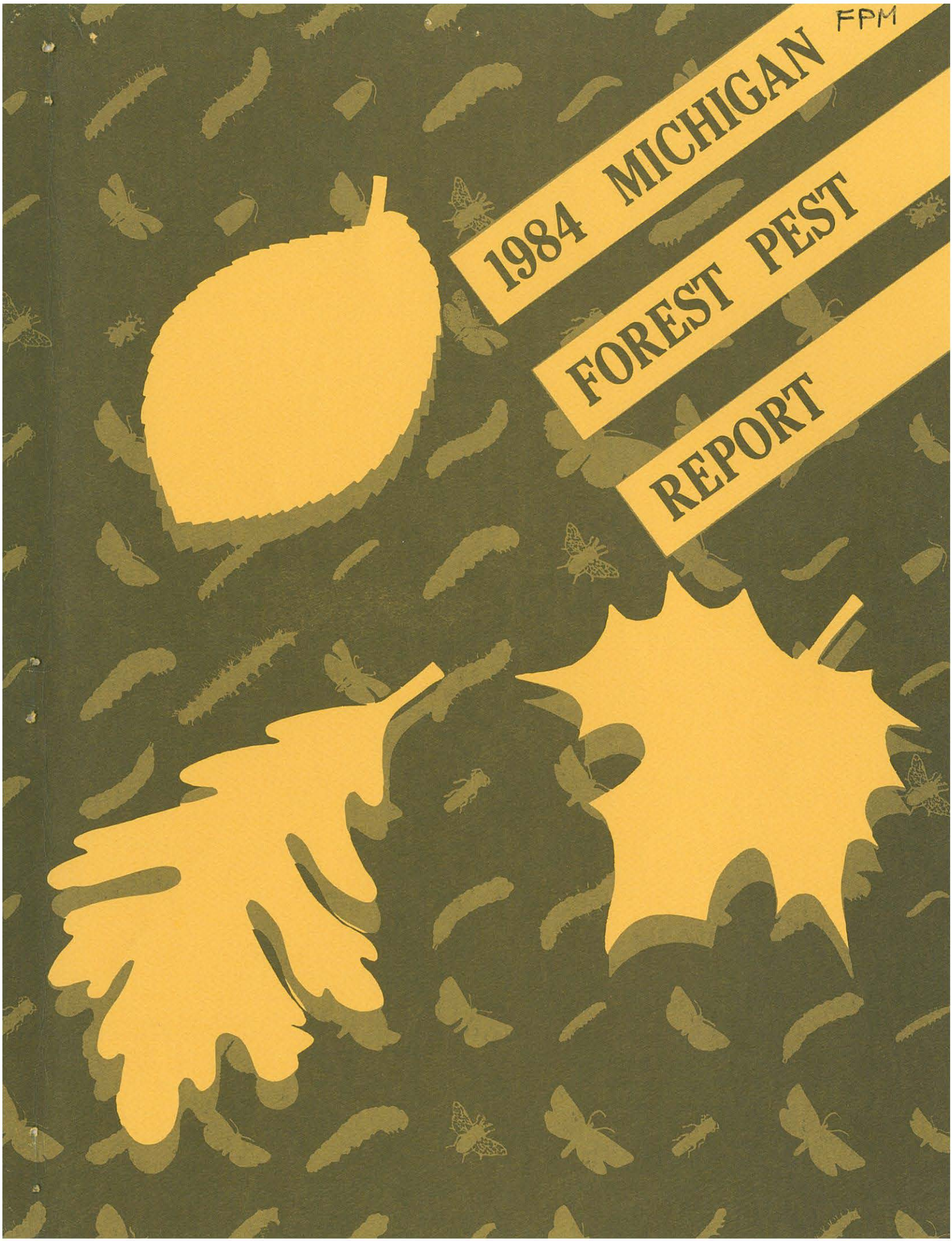
1984 MICHIGAN FOREST PEST REPORT



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Annual Report 1984 (Revised)

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UPPER PENINSULA: REGION I

Robert Heyd

SPRUCE BUDWORM
(Choristoneura fumiferana)

Aerial surveys of spruce-fir defoliation, conducted over 4.7 million acres of state and private forest land, showed that spruce budworm damage had increased since 1983. Of the 181,974 acres defoliated, 69,267 acres were heavily defoliated, 80,150 acres were moderately defoliated, and 32,554 acres were lightly defoliated (Table 1; see maps pgs. 7, 8, 9).

The economics of protecting fir and spruce/fir stands in District 3 (central U.P.) and Dickinson County is being evaluated. Protection would involve spraying marketable stands that would lose a significant cord wood volume if not protected and that cannot be harvested in time to salvage projected losses.

The West Branch campground in Dickinson County was sprayed with Thuricide (a biological insecticide) in early June to protect the remaining spruce and fir trees.

An aerial survey of the Hiawatha National forest conducted by the USDA Forest Service in early August, showed defoliation on 10,420 acres: 2,560 acres of light defoliation, 3,764 acres of moderate defoliation, and 4,096 acres of heavy defoliation (Table 2). Although heavy spruce budworm defoliation has increased since last year's survey, the overall defoliation acreage has decreased 58 percent from 1983 levels.

Table 1. Acres of spruce-fir defoliated by the spruce budworm.

	Acres Defoliated*		
Counties	Light	Moderate	Heavy
Alger	1,570	3,280	2,780
Baraga	1,000	5,000	840
W. Chippewa	-	540	-
Delta	2,500	7,430	6,398
Dickinson	7,020	16,000	11,176
Houghton	2,340	1,480	80
Iron	4,000	15,290	1,553
Keweenaw	1,160	440	-
Luce	1,644	2,430	2,010
W. Mackinac	340	2,440	-
Marquette	4,480	12,000	37,050
Menominee	4,360	8,310	3,720
Schoolcraft	2,140	5,510	3,660
Totals	32,554	80,150	69,267
Total Acres Defoliated =	181,974		

*Light defoliation: light brown cast to trees; less than 50% loss of current needles.
Moderate defoliation: tree tops with darker brown cast than lower canopy; more than 50% loss of current year's needles.
Heavy defoliation: deep brown cast over entire tree; 100% loss of current year's needles with some back-feeding.

Table 2. Spruce budworm damage in the Hiawatha National Forest.

	Acres	
Defoliation	Federal	Private
light	1,792	768
moderate	2,791	973
heavy	3,200	896
Totals	7,783	2,637
Total Acres Defoliated =	10,420	

JACK PINE BUDWORM
(Choristoneura pinus)

The present outbreak first occurred in 1983 with approximately 50 acres heavily defoliated and 120 acres with moderate defoliation. In 1984, Schoolcraft County was the only county affected, but the acreage with damage rose to 7,220 acres of state forest land (see map pg. 10): 3,200 acres of heavy defoliation, and 560 acres of light defoliation, No tree mortality was detected.

The budworm is expected to rapidly build into an epidemic over the next two to four years, affecting much of the jack pine resource in the Upper Peninsula. Impact

plots to monitor losses have been established in areas of current defoliation and will be established in any new problem area.

Aerial surveys conducted by the USDA Forest Service of federal and private land (Table 3) showed that defoliation has increased significantly since 1983, when defoliation totaled 1,535 acres.

Table 3. 1984 Jack pine budworm defoliation in the Hiawatha National Forest.

Defoliation	Federal Acres	Private Acres
Light	6,784	77
Moderate	998	77
Heavy	6,195	1,459
Totals	13,977	1,613

GYPSY MOTH

(Lymantria dispar)

Gypsy moths were caught in two traps within a few miles of each other in Mackinac County. Despite current control projects, gypsy moth populations are expected to increase.

Four hundred acres near Powers and Spaulding in Menominee County were sprayed in the spring of 1984. An intensive detection project, followed by chemical suppression if egg masses are detected appears to have an excellent chance of keeping the U.P. free of gypsy moth for many years.

ORANGEHUMPED MAPLEWORM

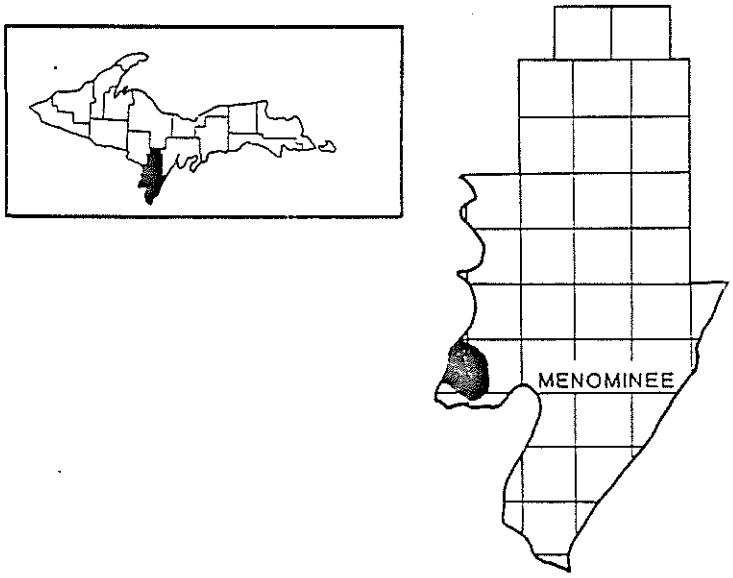
(Symmerista leucitys)

The orange-humped mapleworm defoliated sugar maple in extensive areas of Chippewa and Mackinac counties (map pg. 11). Defoliation was found over 12,360 acres: 8960 acres of heavy defoliation (90 percent or greater), 400 acres of moderate defoliation (70 to 90 percent), and 3,000 acres of light defoliation (30 to 70 percent). There were no noticeable losses, and no control measures were taken.

OAK WILT

(Ceratocystis fagacearum)

In the Shakey Lake area, 27 epicenters of very susceptible red oak (over a 10,600-acre area) are threatened by oak wilt. A control program was initiated in 1984, with 18 of the 27 epicenters treated (for details, see pg. 27).



WHITE GRUBS

(Phyllophaga sp.)

Populations of white grubs vary unpredictably. This year's population was much higher than that found in 1983. They were found in 1,625 acres, causing scattered seedling mortality and growth loss to red and jack pine.

No control measures were taken, and an effective control is badly needed, as grubs will continue to cause problems on old field reforestation sites.

JACK PINE SAWFLY

(Neodiprion pratti)

The jack pine sawfly was seen for the first time in recent years in a southwest part of Schoolcraft County. The area (30 acres) is within a few miles of jack pine defoliated by the jack pine budworm. If these two insects become active in the same stands, control operations will be prescribed.

PEST CONDITIONS REPORT--MINOR PEST PROBLEMS: 1984
Michigan's Upper Peninsula

Pest	Host(s)	Counties	Remarks
Aphids	Jack Pine *(Pinus banksiana)*	Throughout	Commonly present in young jack pine stands before crown closure with occasional heavy populations on individual trees.
Aspen Blotch Miner *(Lithocolletis tremuloidiella)*	Aspen *(Populus tremuloides)*	Throughout	Damage noticeable, but much reduced from previous years.
Balsam Fir Sawfly *(Neodiprion abietis)*	Balsam Fir *(Abies balsamea)*	Delta	Heavily defoliated areas near Lake Michigan shoreline.
Birch Leafminer *(Fenusa pusilla)*	White or Paper Birch *(Betula papyrifera)*	Throughout	Populations seemed to be low in most areas.
Birch Skeletonizer *(Bucculatrix canadensisella)*	White or Paper Birch *(B. papyrifera)*	Throughout	Heavy defoliation in areas near Lake Michigan shoreline especially in Delta and Schoolcraft Counties.
Bladder Gall Mites (Eriophyid mites - probably *Vasates quadripedes)*	Silver and Red Maple *(Acer saccharinum* and *A. rubrum)*	Throughout	Frequent calls from concerned homeowners.
Bronze Birch Borer *(Agrilux anxius)*	White or Paper Birch	Throughout	
Fall Cankerworm *(Alsophila pometaria)*	Hardwoods	Chippewa, Iron	Scattered areas of heavy defoliation in Sugar Maple and associated hardwoods.
Forest Tent Caterpillar *(Malacosoma distria)*	Quaking Aspen *(Populus tremuloides)* Sugar Maple *A. saccharum*	Ontonagon	Light to moderate defoliation over 48,415 acres with small, scattered pockets of heavy defoliation.
Gall Rusts *(Cronartium quercuum)* *(Endocronartium harknessii)*	Jack Pine Scotts Pine *(P. sylvestris)*	Throughout	Common in most jack pine areas.

Minor Pest Problems: 1984 (continued)

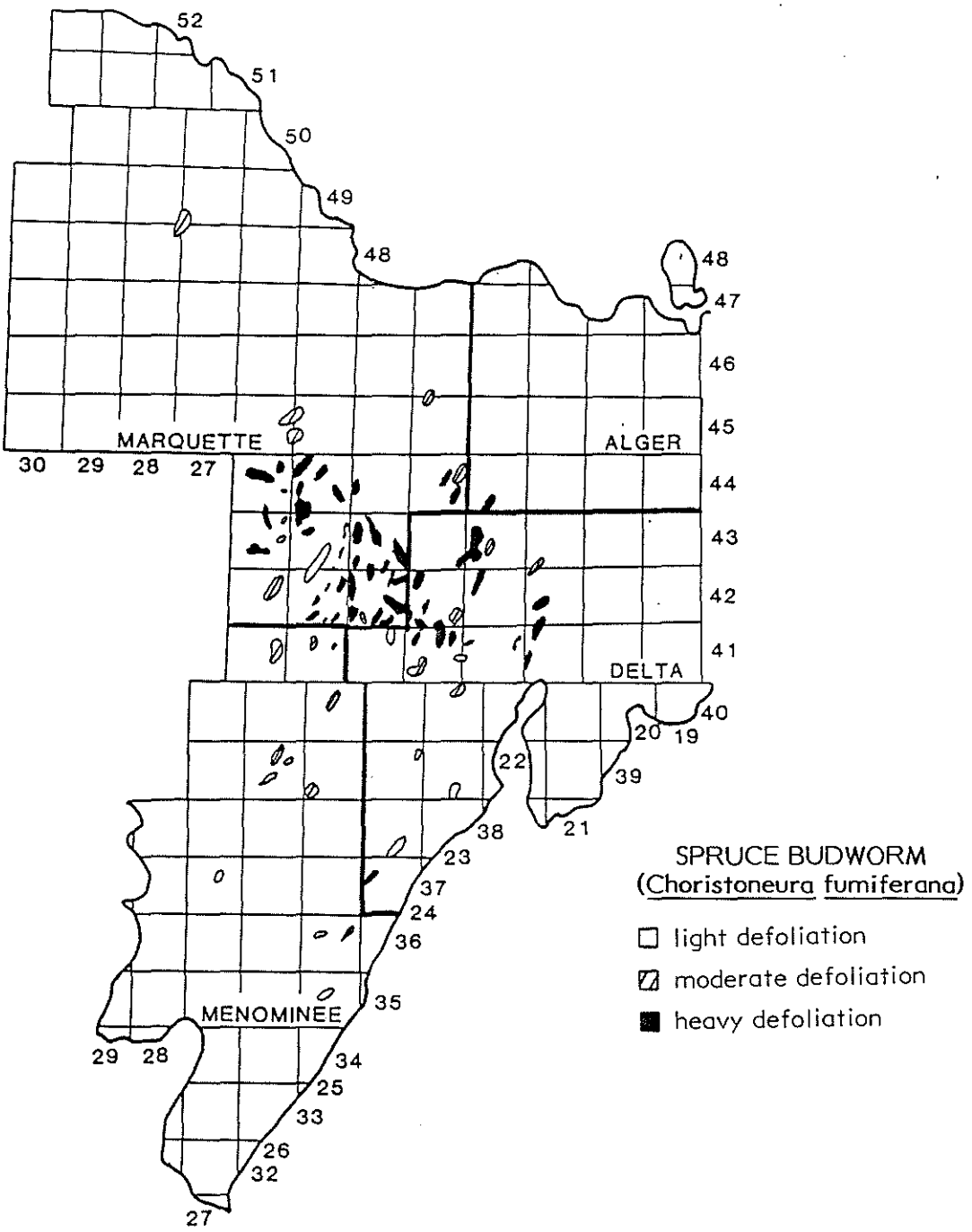
Pest	Host(s)	Counties	Remarks
Hypoxylon Canker *(Hypoxylon mammatum)*	Quaking Aspen	Throughout	
Japanese Beetle	Various yard trees & shrubbery	Mackinac	Dense populations along southern shore areas of Manistique Lake.
Linden Looper *Erannis tiliaria)*	Maple *(Acer sp.)* Basswood *(Tilia americana)*	Ontonagon	Heavy defoliation in the south portion of Porcupine Mt. State Park along 3 miles of trail (approximately 600-1000 acres defoliated).
Maple Decline	Sugar Maple *(Acer saccharum)*	Marquette, Menominee	Continuing problem in urban areas.
Maple Trumpet Skeletonizer *(Epinotia aceriella)*	Sugar Maple *(A. saccharum)*	Throughout	Noticeable in many areas without significant loss of foliage.
Mountain-Ash Sawfly *(Pristiphora geniculata)*	American Mountain-Ash *(Pyrus americana)*	Throughout	Many calls from concerned homeowners.
Oak Decline	Northern Red Oak *(Quercus rubia)*	Throughout	Severe drought of 1983 caused thinning crowns with scattered dead limbs and some leaf chlorosis-- especially in Menominee County (10,000 acres).
Pine Engraver *(Ips pini)*	Jack and Red Pine	Throughout	Drought of 1983 and a very dry spring, 1984, may have contributed to small scattered pockets of bark beetle attacked trees on dry sites in many areas.
Pine Root Collar Weevil *(Hylobius radicus)*	Scotts Pine	Throughout	May be a limiting factor to Scotts pine plantation efforts in the U.P.

Minor Pest Problems: 1984 (continued)

Pest	Host	Counties	Remarks
Pine Spittlebug *(Aphrophora parallella)*	Scotts and Jack Pine	Throughout	Commonly found in low numbers.
Pitch Module Maker *(Patrova albicapitana)*	Jack Pine	Throughout	Commonly found in low numbers, although on one site 40% of the trees had at least one attack.
Red Pine Needle Midge *(Contarinia sp.)*	Red ans Scotts Pine	Delta, Dickinson, East Iron, Marquette	Populations down this year.
Red-Headed Pine Sawfly *(Neodiprion lecontei)*	Red and Scotts Pine	Luce, Mackinac	Two plantings (30 acres) on private land sprayed. Several plantations on state and private land with small pockets of heavy defoliation. Populations appear to be building.
Rhizophaera Needlecast *(Rhizosphaera kalkhoffi)*	Spruce *(Picea sp.)*	Delta, Menominee	Christmas tree plantations.
Scleroderris Canker *(Gremmeniella abietina)*	Red and Jack Pine	Alger, Luce, Marquette, Schoolcraft	Light flagging in lower whorls infrequent.
Variable Oak Leaf Caterpillar *(Heterocampa manteo)*	Beech *(Fagus grandifolia)* White Birch	Alger, Delta	Populations not evident this year after last year's heavy defoliation in areas around Round Lake.
White Pine Weevil *(Pissoides strobi)*	Jack Pine	Baraga, Luce, Marquette	Jack pine is commonly weevilled. Marquette County had plantations with 20% weevilling in 1984.
White Trunk Rot of Aspen *(Phellinus tremulae)*	Aspen *(Populus sp.)*	Throughout	A large portion of our aspen resource is mature or overmature and in need of harvesting.

Minor Pest Problems: 1984 (continued)

Pest	Host(s)	Counties	Remarks
Winter Injury	White Spruce *(Picea glauca)* Red and Scotts Pine	Throughout	High temperatures in February (60°F) caused winter injury of many conifers.
Yellow-Headed Spruce Sawfly *(Pikonema alaskensis)*	White Spruce	Luce, Schoolcraft	Young open grown spruce, usually in Christmas tree plantations suffered severe defoliation.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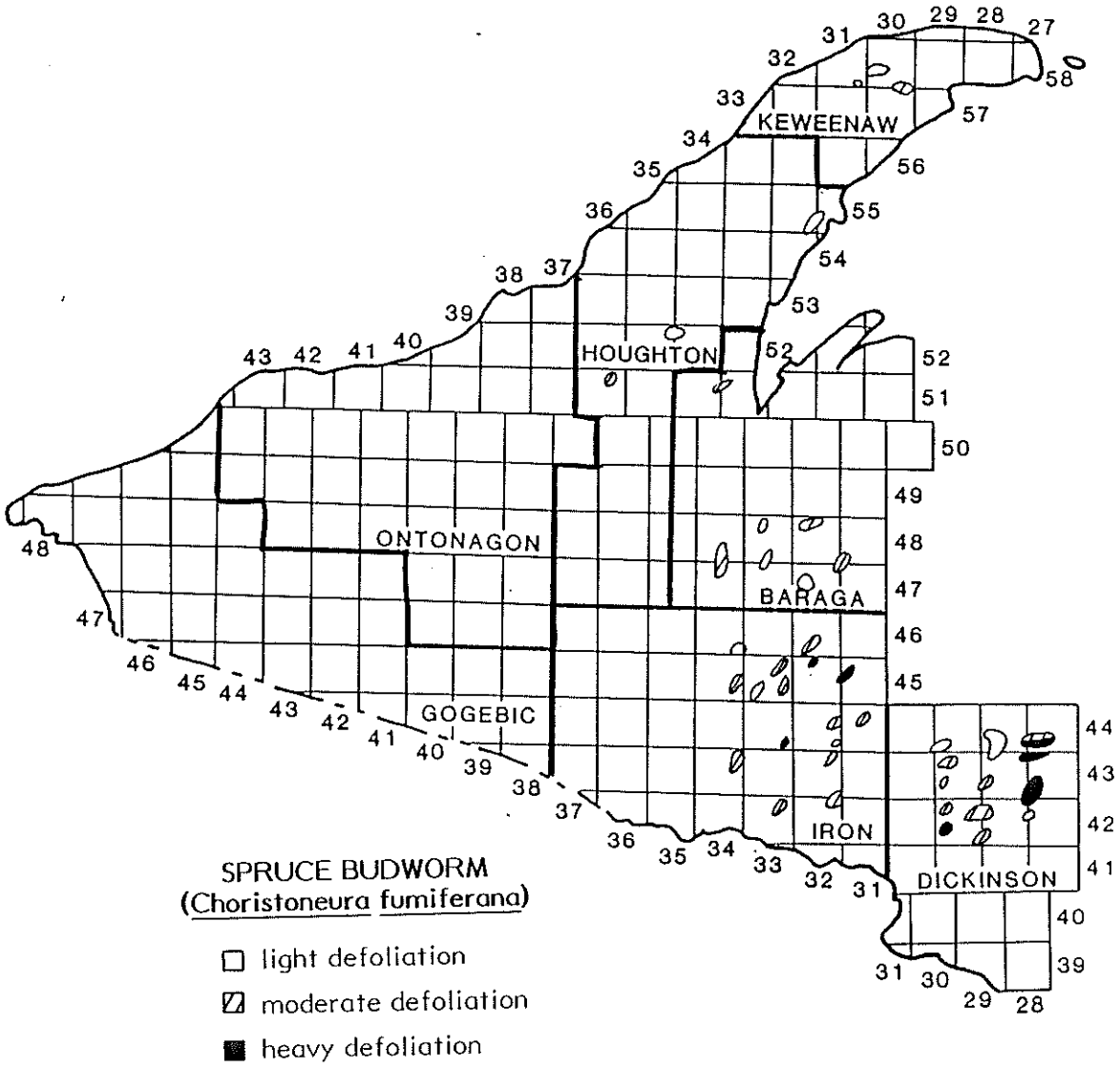
SPRUCE BUDWORM
(Choristoneura fumiferana)
light defoliation
moderate defoliation
heavy defoliation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(Choristoneura fumiferana)
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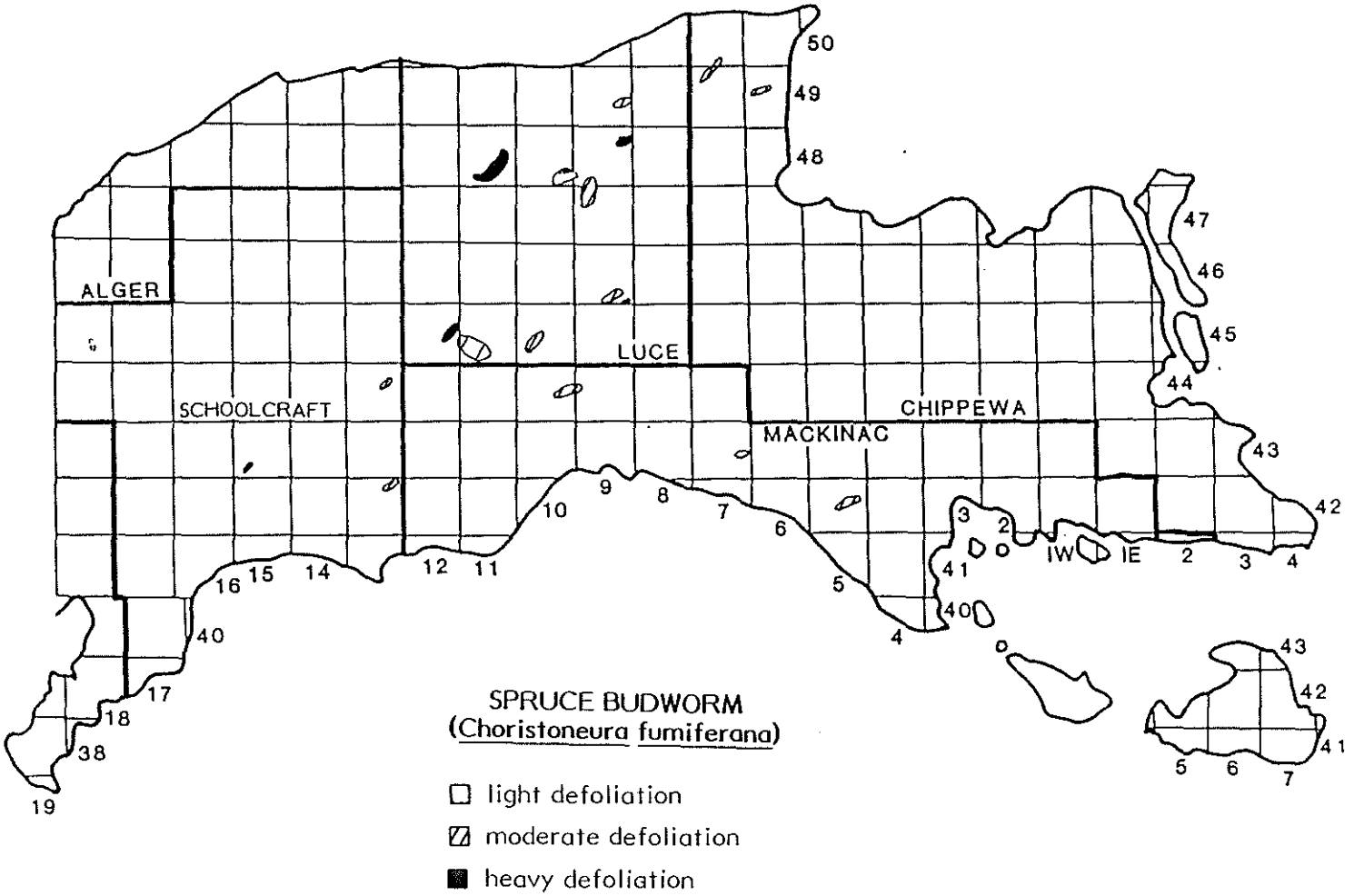
moderate defoliation
heavy defoliation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(Choristoneura fumiferana)
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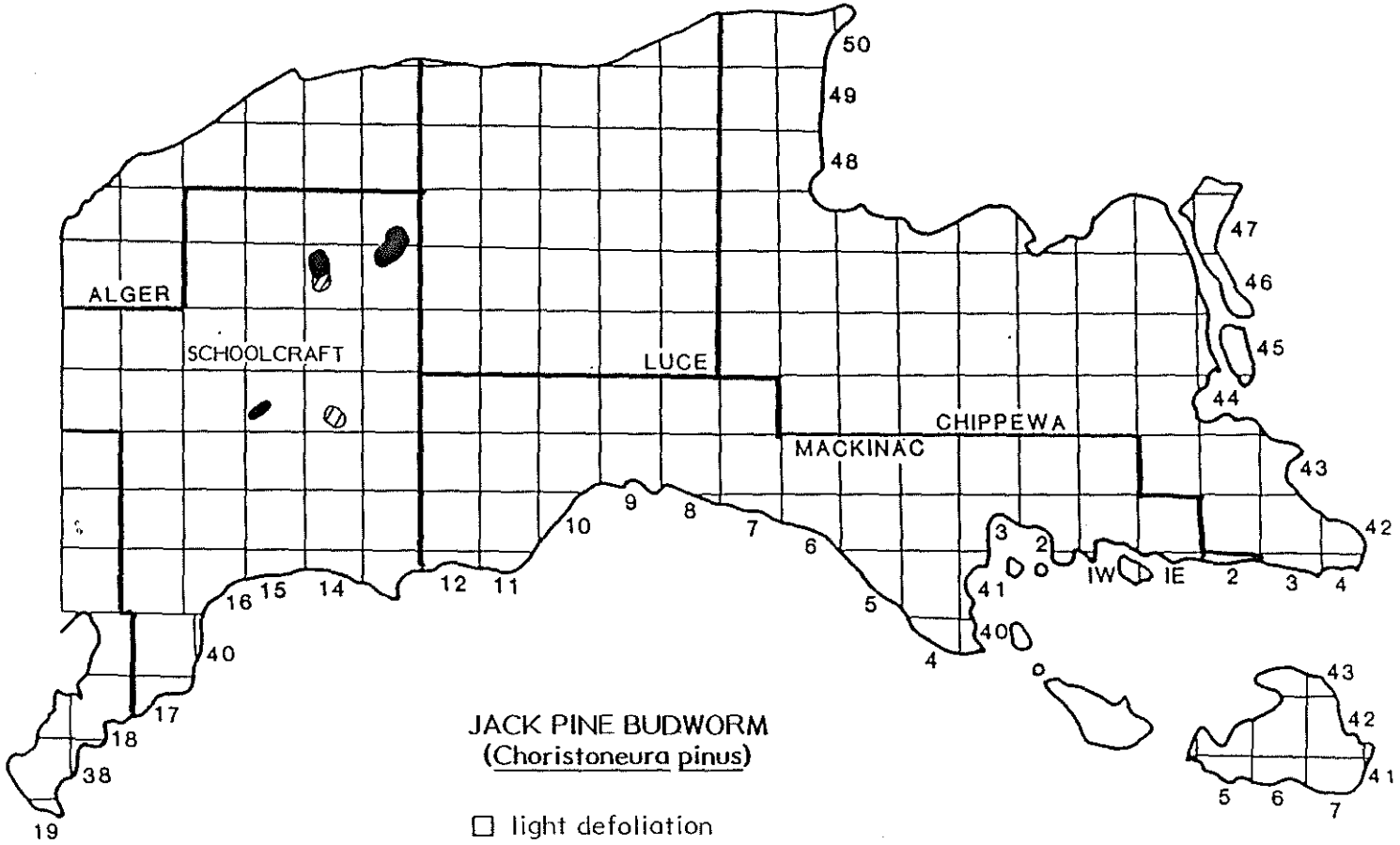
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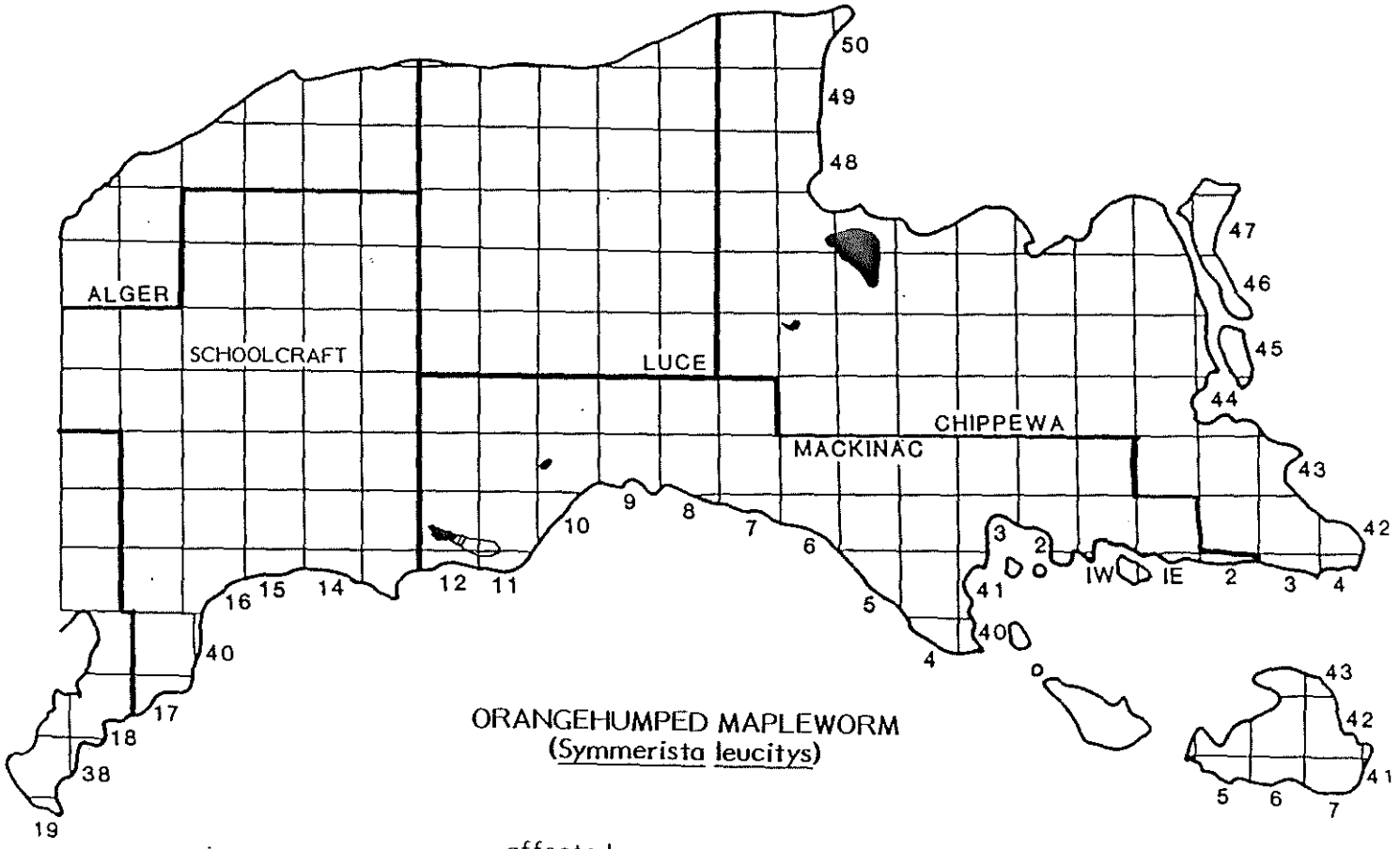
JACK PINE BUDWORM
(Choristoneura pinus)
light defoliation
moderate defoliation
heavy defoliation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ORANGEHUMPED MAPLEWORM
(Symmerista leucitys)
affected area

LOWER PENINSULA: REGION II
Ron Murray

JACK PINE BUDWORM

(Choristoneura pinus)

Defoliation by the jack pine budworm was down from 1983 levels (a 50 percent and more reduction in population levels). No direct controls were needed. The area of high damage extended into Cheboygan and Presque Isle counties. Total defoliation covered 627,740 acres (Table 4). A total of 365,720 acres classified as stand condition I are predicted to have a 35 percent loss during this outbreak. (See pages 16, 17, and 18 for maps.)

Pupal survey results (map, page 17) indicate a potential, low-moderate population in a reduced number of stands regionwide for 1985.

Aerial surveys of the Huron-Manistee National Forest showed a 45 percent drop in jack pine defoliation compared to 1983. Defoliation severity in all three categories dropped sharply (Table 5) from 1983 levels. The populations on the Mid Ranger District have virtually collapsed. Most of the moderate and all of the heavy defoliation is found on the Tawas Ranger District.

Table 4. 1984 Stand condition levels, in acres for jack pine budworm.

County	Level I		Level II		Totals
	State	Private	State	Private	
Alcona	18,510	4,440	2,600	8,190	33,740
Arenac	-	-	-	300	300
Antrim	-	-	10,880	360	11,240
Cheboygan	20,000	-	12,960	8,640	41,600
Clare	-	-	4,780	2,500	7,280
Crawford	79,764	64,042	12,416	8,789	165,011
Gladwin	-	-	800	560	1,360
Grand Traverse	18,901	4,779	6,272	2,261	32,213
Iosco	280	4,760	9,140	3,260	17,440
Kalkaska	26,312	5,080	12,000	1,600	44,992
Lake	-	-	80	-	80
Missaukee	-	-	1,020	1,450	2,470
Montmorency	7,040	12,000	8,080	16,785	43,905
Ogemaw	28,820	10,240	7,280	5,760	52,100
Oscoda	10,590	21,600	600	31,000	63,790
Otsego	4,320	1,760	9,440	2,720	18,240
Presque Isle	15,000	-	13,380	200	28,580
Roscommon	4,040	600	6,960	22,720	34,320
Wexford	-	-	4,104	680	4,784
TOTAL	238,577	129,301	122,792	117,775	608,445
Federal lands:	Level I				2,842
	Level II				19,501

*Gross acres (includes other types within boundary)

Level I: average 35% mortality during the rest of the infestation; top kill and deformity; 90% growth loss in current year.

Level II: less than 10% mortality during the rest of the infestation; top kill and deformity; 55% growth loss in current year.

Table 5. 1984 Defoliation by jack pine budworm in Huron-Manistee National Forest.

Defoliation	Federal Acres	Private Acres
Huron National Forest		
Light	10,470	640
Moderate	7,706	410
Heavy	2,842	282
Total	21,018	1,332
Manistee		
Light	1,331	563
Moderate	0	51
Total	1,331	614

Table 6. 1984 white pine weevil damage in plantations less than 10 years old. Acres by damage class.

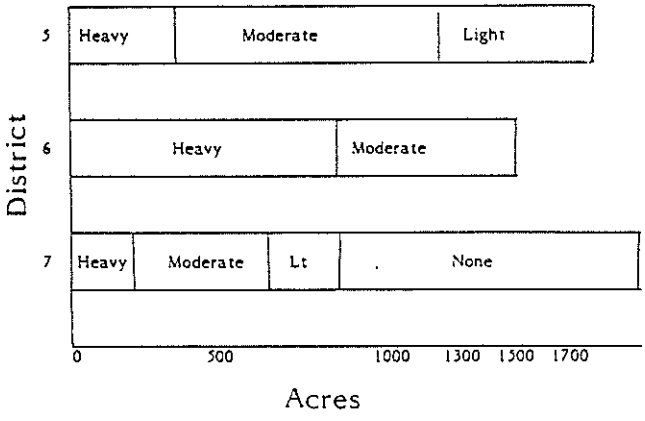
Damage %	District 5	6	7	Region
None (0%)	0	0	840	840
Trace (<1%)	0	0	0	0
Light (1-5%)	324	0	110	434
Moderate (6-20%)	852	455	488	1795
Heavy (21+%)	333	852	261	1446
Total	1509	1307	1699	4515

WHITE PINE WEEVIL
(Pissodes strobi)

White pine weevil damage decreased--down seven percent from 23 percent current weevilling in 1983 to 16 percent in 1984. Damage rates ranged from -72 percent to +567 percent of 1983 levels. Generally, plantations with high damage rates in 1983 had significant drops. Total area affected was 50,000 acres (see maps, pg. 19).

Pilot tests of Orthene, L-Syston, and Dimilin were applied to 112 acres in the spring. The Orthene plots had significant reductions in damage; the L-Syston and Dimilin plots did not. Further tests are planned.

Figure1. Graphic presentation of 1984 white pine weevil damage.



As in 1983, most 'None' class are newly planted or overtopped by competition.

RED PINE SHOOT BORER
(Dioryctria resinosella)

Damage continues to decrease in both extent and severity, with more than 100,000 acres of infestation (map pg. 20). Trace infestation was found on 512,000 acres; light infestation on 276,480 acres; and moderate/high infestation on 378,880 acres. No tree mortality is evident, although flat-topped crowns indicate a height growth loss. Infestations are expected to decrease.

SARATOGA SPITTLEBUG
(Aphrophora saratogensis)

Populations were down from 1983 levels, and no significant losses occurred in 1984 on state land. A total of 1,166 acres of potential damage were surveyed; 386 acres showed a low population (0.01 to 1 nymphs/tree unit) and 864 acres had no spittlebugs (see map, page 19).

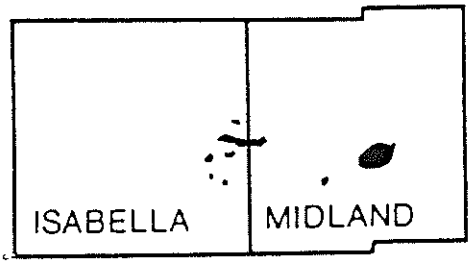
Populations are expected to increase over the next three years or so to potentially damaging levels.

GYPSY MOTH
(Lymantria dispar)

Populations and damage have increased since 1983. Forty acres of state-owned land in the Oil City area were infested, as were 6,960 acres of privately owned land. Most of the stands had light, spotty infestations with small (a few acres) spots heavily stripped.

No significant tree mortality occurred, although local residents were upset by the seeming invasion. Phone calls, letters, and face-to-face meetings have helped alleviate their concerns--and educate them as to future scenarios.

Although disease was found, population levels are expected to increase, causing more damage and concern.



REDHEADED PINE SAWFLY
(Neodiprion lecontei)

More infestations and more serious damage occurred in 1984 than in 1983. The total area covered 50 to 100 acres (see map, pg. 21). The plantations that were monitored covered 18,000 acres. Only one 15-acre stand in Northern Cheboygan County had a heavy enough population to warrant spraying. Others were small pocket or simple colony infestations.

A pilot test using Safers insecticidal soap was applied on the Cheboygan County site. The soap was applied with hand sprayers, and tree mortality was substantially avoided.

SADDLED PROMINENT
(Heterocampa guttivitta)

The saddled prominent is causing increasing damage, and higher populations with more extensive damage are expected in 1985. Moderate defoliation was found over 3,000 acres, and 1,000 acres experienced light defoliation (see map, page 23). Most trees in these stands were less than 50 percent defoliated. Defoliation was concentrated on beech trees.

VARIABLE OAK LEAF CATERPILLAR
(Heterocampa manteo)
ORANGESTRIPED OAKWORM
(Anisota senatoria)
REDHUMPED OAKWORM
(Symmerista canicosta)

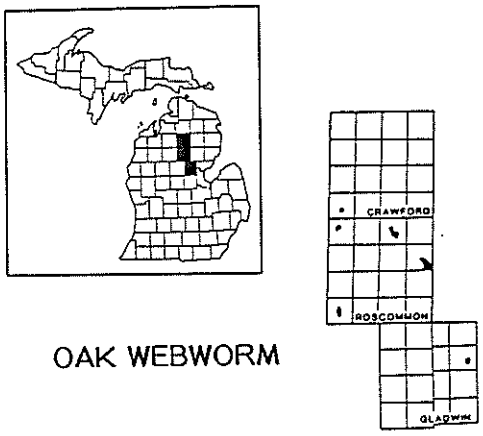
Damage from these pests was found in Lake and Benzie counties (see maps, page 23). No significant impact occurred, but outbreaks are expected next year in larger and more numerous locations.

FALL CANKERWORM
(Alsophila pomentaria)

Isolated infestations were found on a few trees in many scattered locations. No significant losses occurred, though the pest was noticeably more prevalent than in the past few years. Populations are expected to increase.

CHERRY SCALLOPSHELL MOTH
(Hydria prunivorta)
MAPLE TRUMPET SKELETONIZER
(Epinotia aceriella)
MAPLE LEAF CUTTER
(Paraclemensia acerifoliella)
OAK WEBWORM
(Archips fervidanus)

Damage from these pests was found in many scattered infestations regionwide (see maps, pages 22, 24, 25). No significant losses occurred, though all of these defoliators have had significant increases in populations and damage in the past few years. Increased activity is expected.

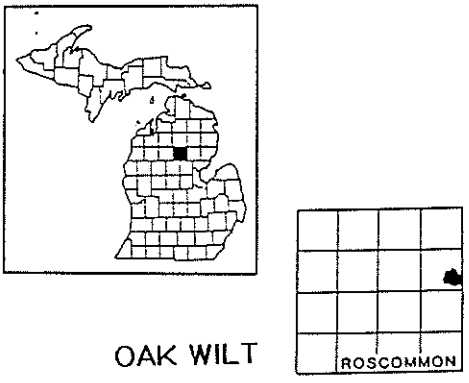


OAK WEBWORM

OAK WILT
(Ceratocystis fagacearum)

Oak wilt continued to be a problem in Roscommon County concentrated in and around St. Helen. Many homeowners in the St. Helen area are losing all of their oak trees. One epicenter is near Denzer Lake, Grand Traverse County.

Although many epicenters are treated by the owner, many are not. The MDA has no funds for control operations, and the MDNR is not charged to control infestations on private land. Epicenters on state land are being treated.



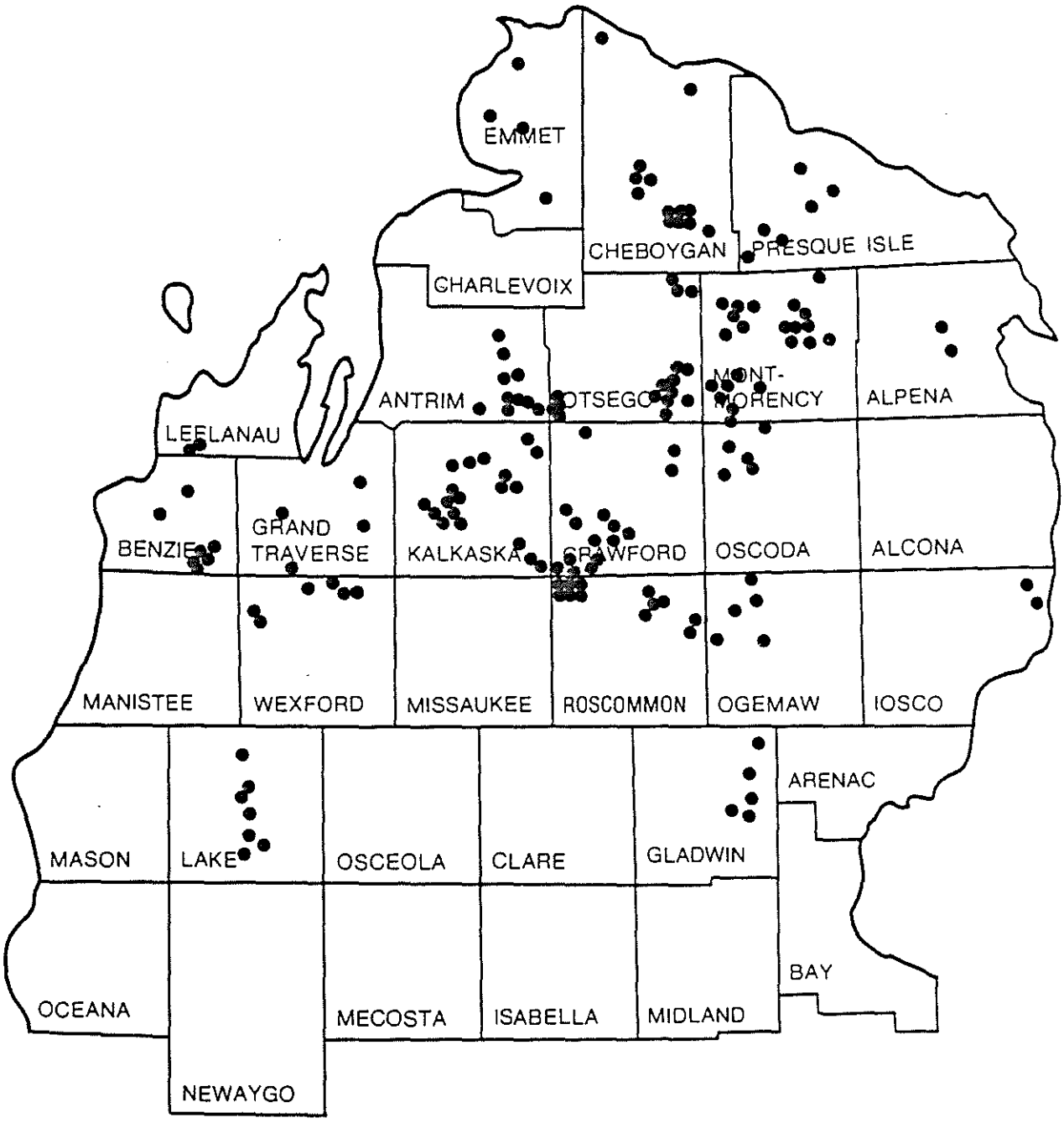
OAK WILT

MAPLE DECLINE/WATER STRESS

Many single, mature maple trees suffered from water and mechanical stress throughout the region. Symptoms ranged from dried, discolored leaves and branch dieback to tree mortality. Many of the trees affected are valuable from the visual and real estate standpoint. No serious forest losses occurred. In forests, mortality may increase in 1985 if droughty conditions continue.

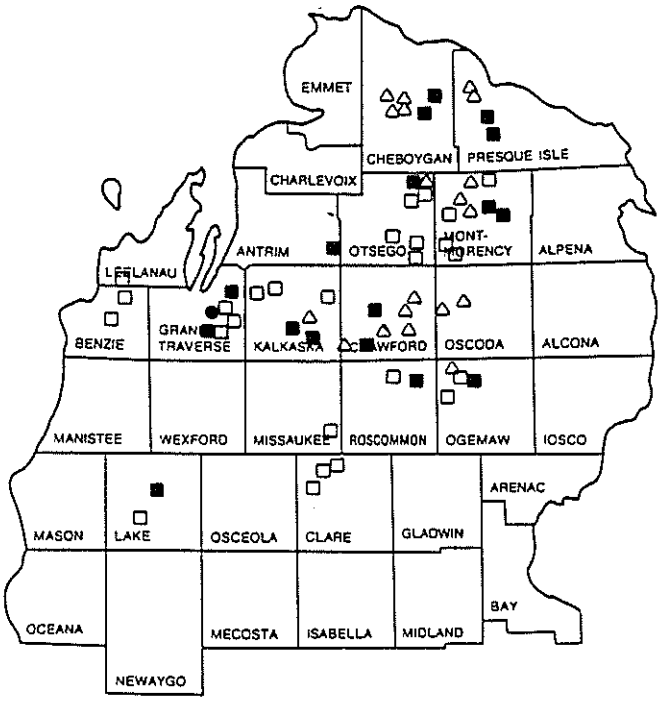
SCLERODERRIS CANKER
(Gremmeniella abietina)

Forty acres were found with damage in Otsego County, west of Gaylord. Damage consisted of lower branch mortality in low-lying pockets. No significant losses occurred, and damage is not expected to increase.



JACK PINE BUDWORM

PLANTATIONS MONITORED—1984

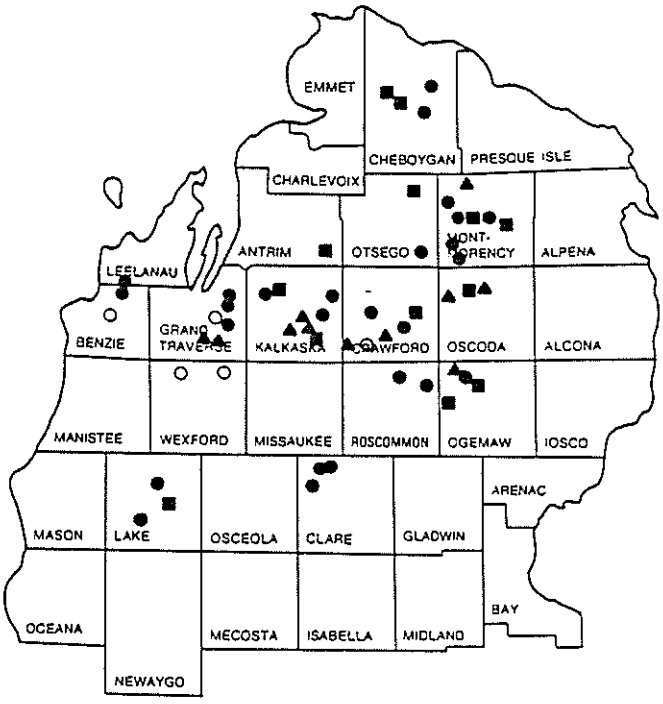


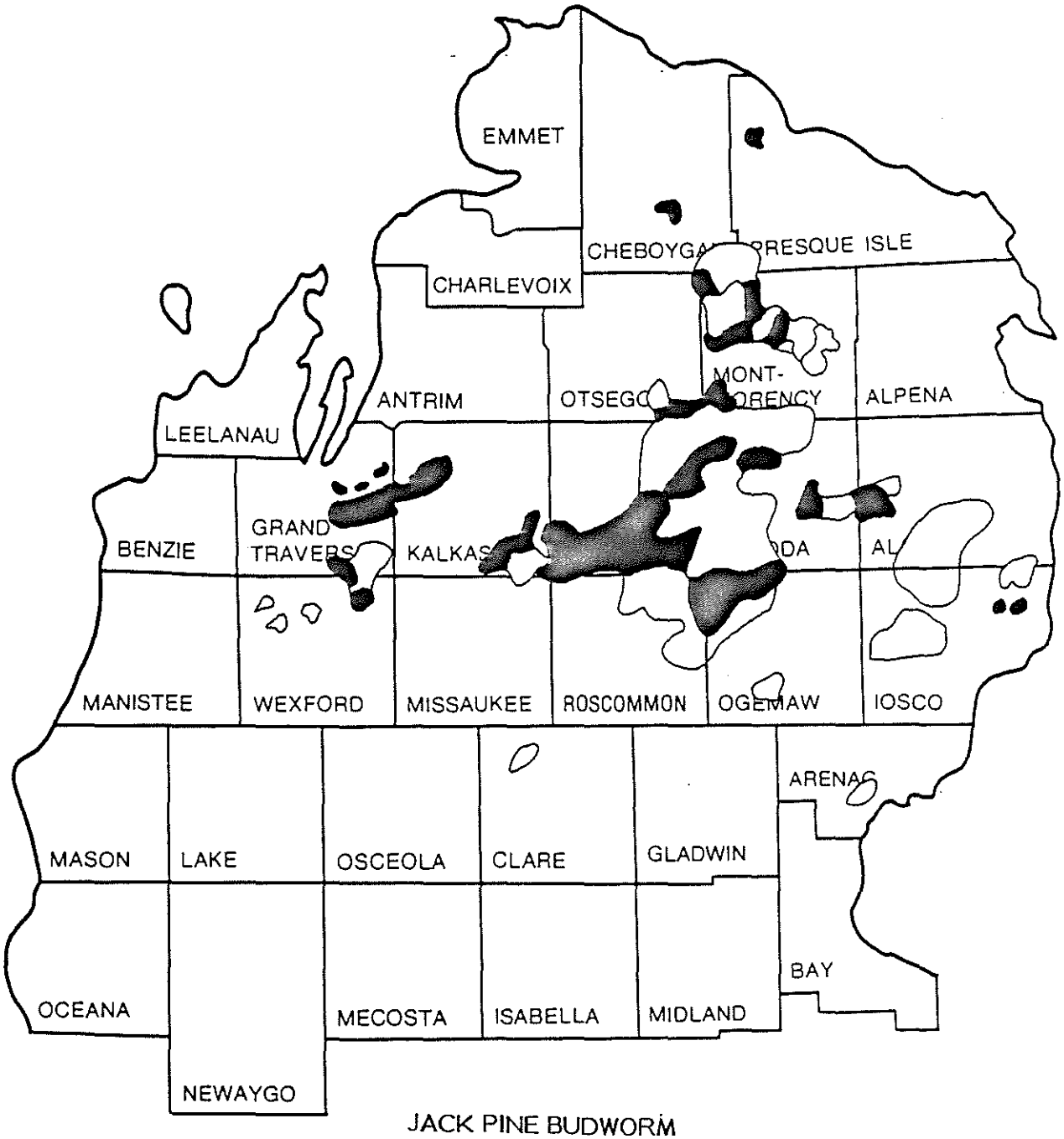
JACK PINE BUDWORM
Damage Survey 1984

- o no defoliation
- ● trace: 1 - 5% defoliation
- □ light: 6 - 15% defoliation
- ■ moderate: 16 - 25% defoliation
- △ high: 26 - 50% defoliation
- ▲ severe: 51 - 75% defoliation
- ★ extreme: 76 +% defoliation

JACK PINE BUDWORM
Pupal Survey 1984
(15-minute search of 15" branch samples)

- o no pupae
- ● low: 1-11 pupae
- ■ moderate: 12-24 pupae
- ▲ high: 25+ pupae

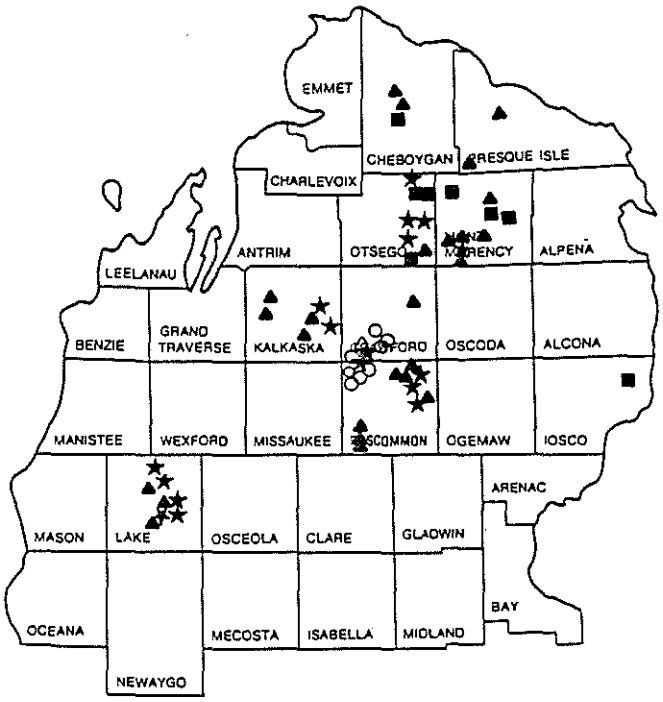




JACK PINE BUDWORM
Stand Conditions

■ Site Condition Level I: Average 35% mortality during rest of infestation; top kill and deformity; 90% growth loss in current year.

□ Site Condition Level II: less than 10% mortality during the rest of the infestation; top kill and deformity; 55% growth loss in current year.

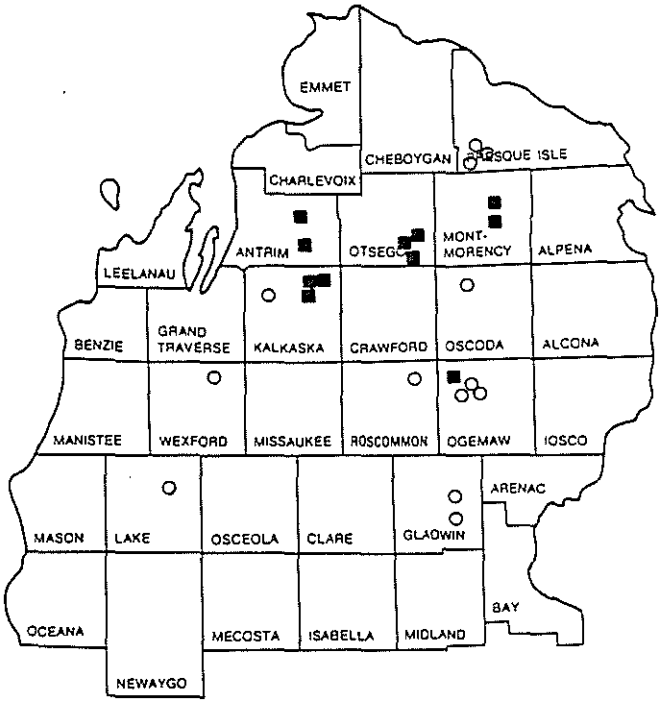


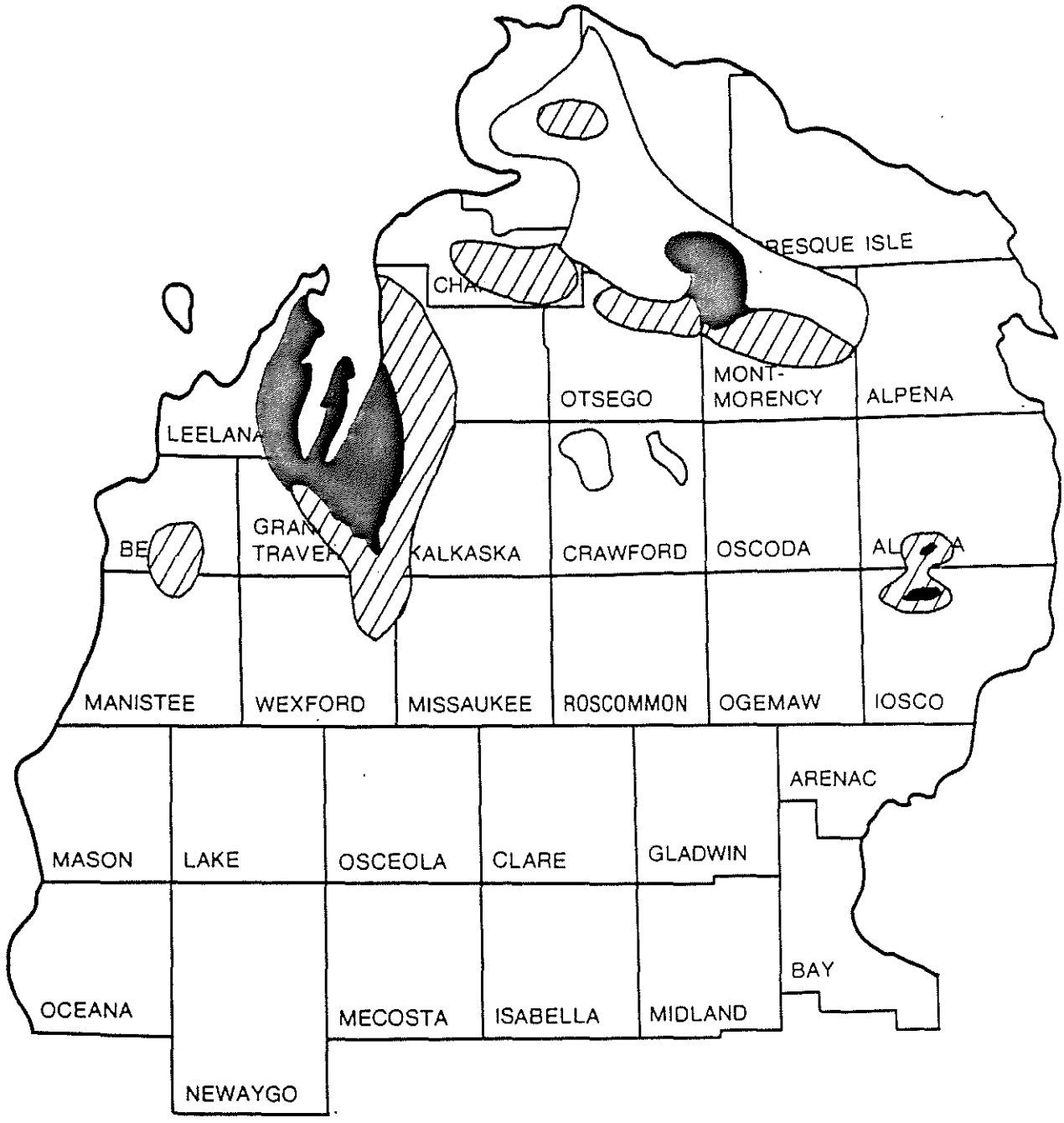
WHITE PINE WEEVIL
(plantations less than 10 years old)

- ○ no damage
- ● few: < 1%
- ■ common: 1 - 5%
- ▲ abundant: 6 - 20%
- ★ extreme: 21+%

SARATOGA SPITTLEBUG
Nymphal Survey 1984

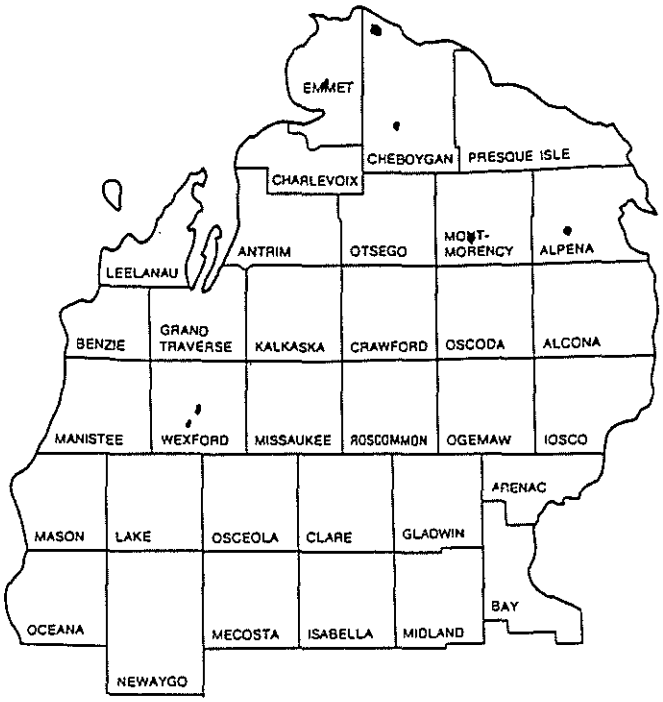
- ○ low: 0-1.0 nymphs/tree unit
- ● moderate: 1.01 - 2 nymphs/tree unit
- ■ no spittlebug present





RED PINE SHOOT BORER DAMAGE—1984

- ■ moderate to high
- ▨ low
- □ trace



REDHEADED PINE SAWFLY

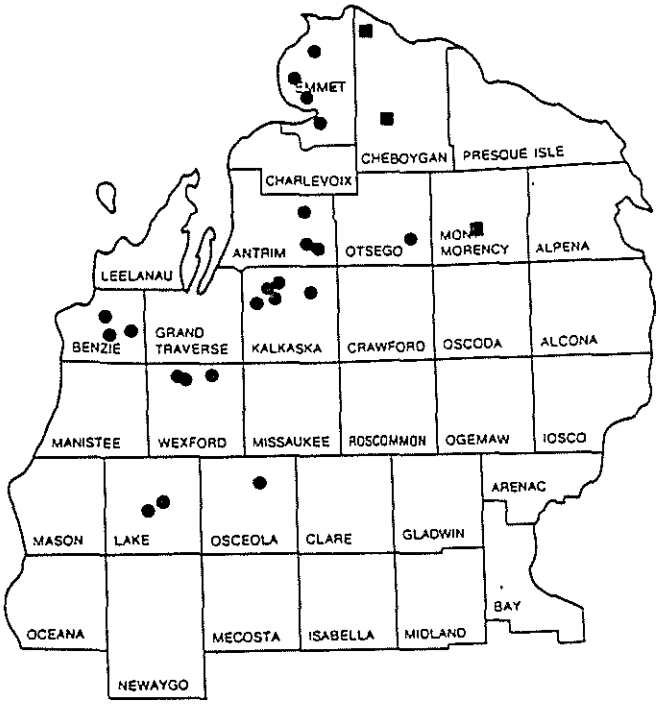
■ area of damage

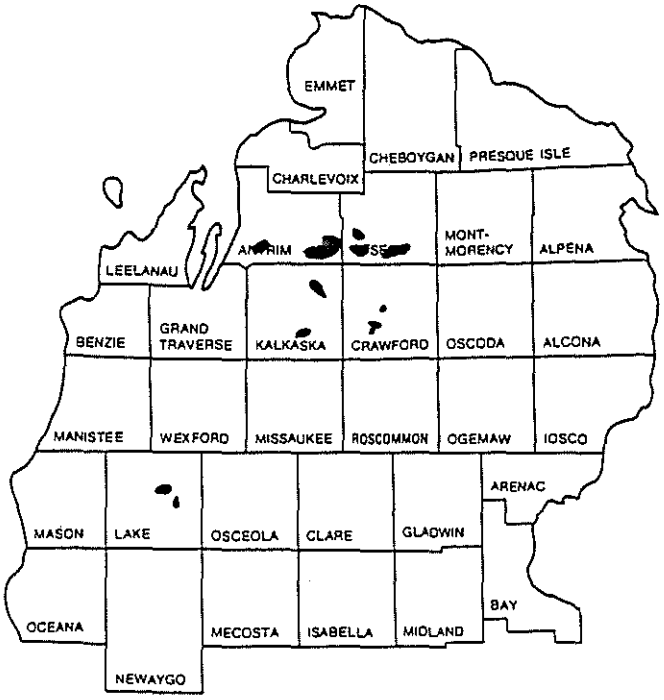
REDHEADED PINE SAWFLY

Plantations monitored

■ positive

● negative





CHERRY SCALLOP SHELL MOTH

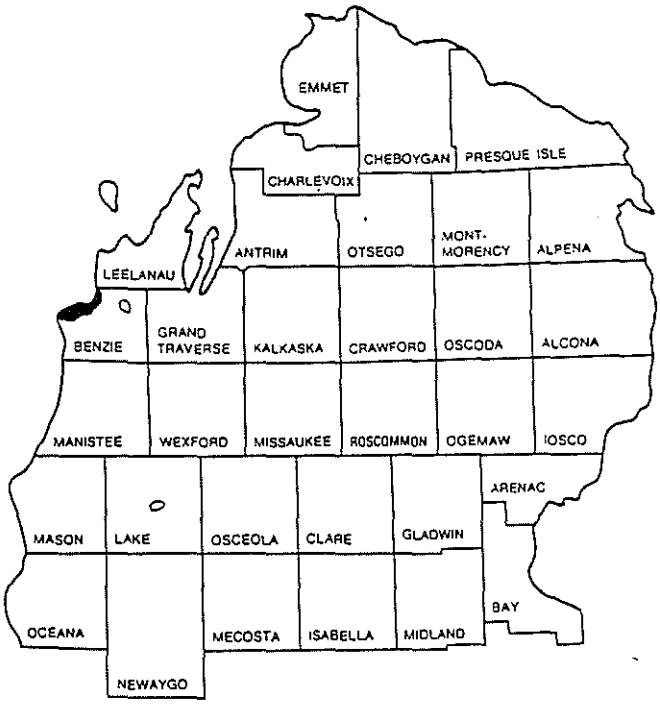
■ heavy defoliation

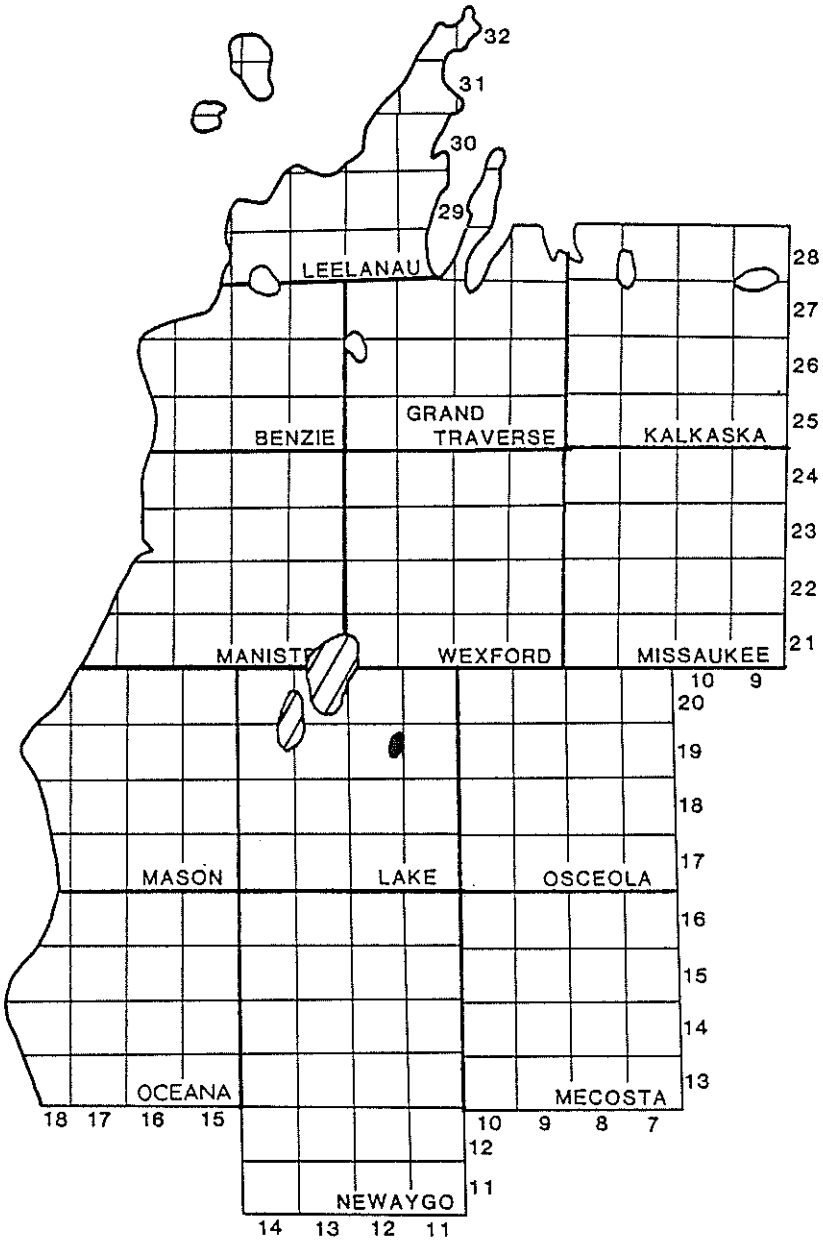
REDHUMPED OAKWORM

□ low

▨ moderate

■ high

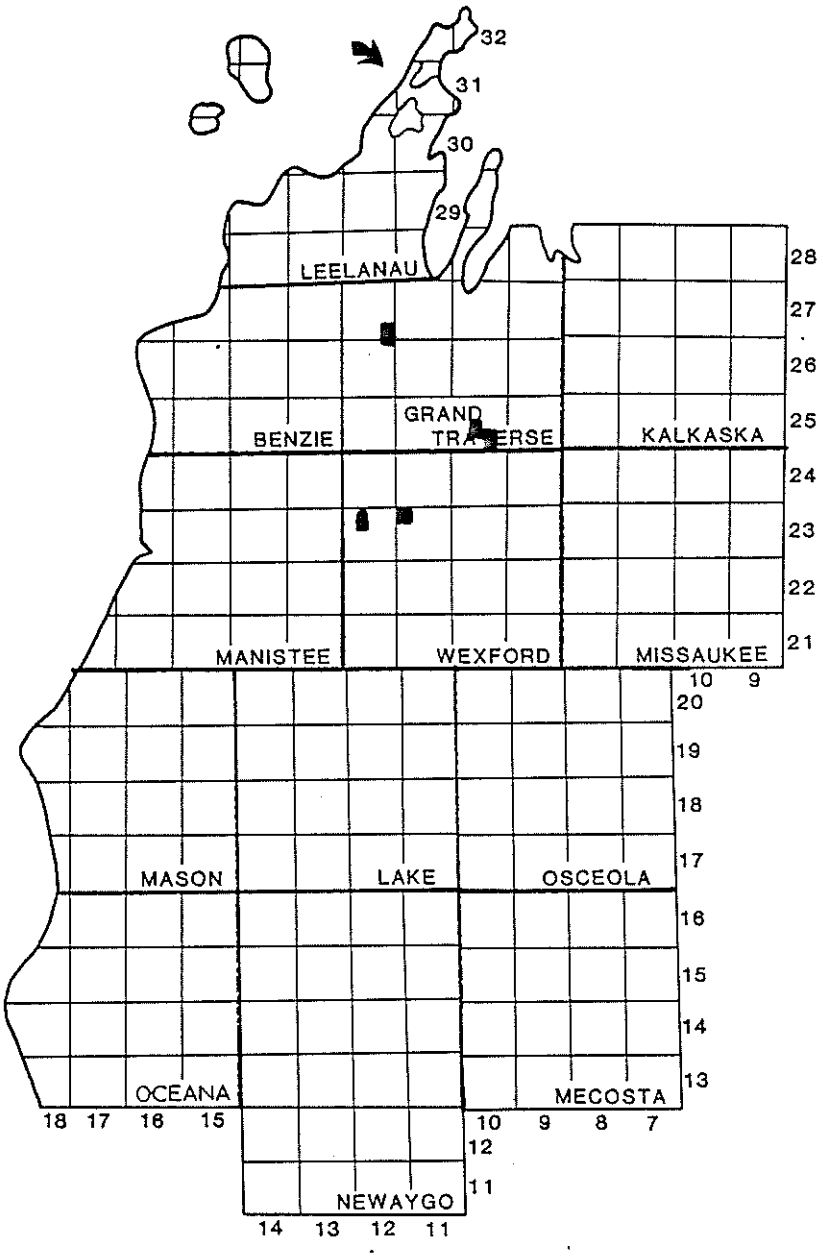




■ ORANGESTRIPED OAKWORM

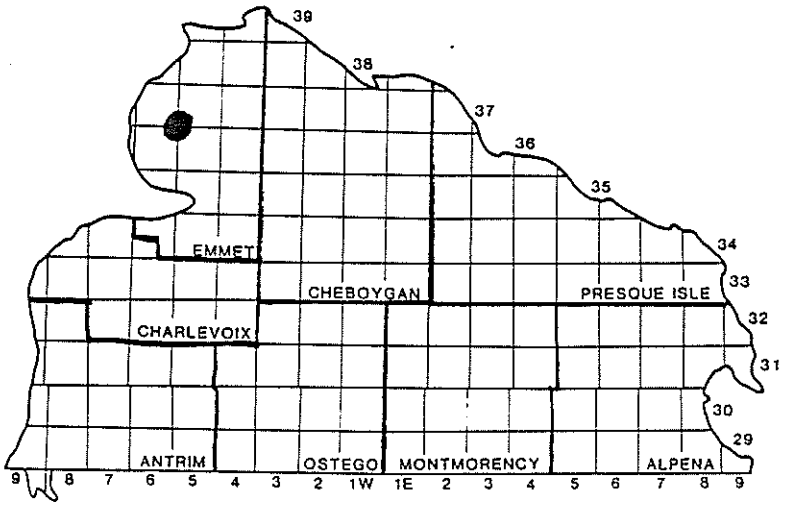
▨ VARIABLE OAKLEAF CATERPILLAR

□ SADDLED PROMINENT



■ MAPLE LEAF CUTTER

□ MAPLE TRUMPET SKELETONIZER



MAPLE TRUMPET SKELETONIZER

■ moderate defoliation

PROJECTS OF THE DNR IN THE U.P.
(R. Heyd, DNR)

Jack Pine Budworm *(Choristoneura pinus)*

Fifteen impact plots were established to monitor losses from budworm defoliation. Plots were placed within and on the perimeter of outbreak areas in jack pine stands. Plots will be used to study the short-term and long range impacts of budworm feeding. As the outbreak spreads to new areas, additional plots will be established.

Pheromones for Detecting Red-Headed Pine Sawfly and Jack Pine Budworm Populations

Our first experience using pheromones to detect populations of potentially destructive forest insects was a learning process. Dr. Harold Coppell from the University of Wisconsin, Madison, provided a small number of pheromone lures for the red-headed pine sawfly, *Neodiprion lecontii*. We used these lures in Zoecon Pherocon 1C traps. Traps were placed in and near areas where sawfly activity was reported in 1983. Our thoughts were to use traps to detect areas with unusually high numbers of sawfly adults in June, thus forewarning potentially heavy defoliation of red and/or jack pine in the area. All the areas selected had heavy sawfly populations, and the sticky traps were quickly saturated with adult sawflies. This attests to the effectiveness of the lure, but didn't provide a measure of the numbers of adults one might expect in areas with low to moderate sawfly populations.

Dr. Christopher Sanders, Great Lakes Forest Research Centre, Sault Ste. Marie, Canada, provided samples of a pheromone he is currently developing for the jack pine budworm. This lure was used experimentally to count the numbers of male moths in heavily, moderately, and lightly infested jack pine stands and in stands without detectable budworm defoliation, yet with a history of budworm damage during epidemic years. Approximately 100 traps were placed. Many moths were trapped with good variation in the number of moths per trap between areas. We will correlate the 1984 trap information with jack pine defoliation levels in 1985 to test the predictive values of the 1984 pheromone trap catches. When Dr. Sanders finalizes the trap design and pheromone formulation, this pheromone can be used to monitor long-term fluctuations in population density for long range prediction of epidemics. (Note: A trap and pheromone are currently available for spruce budworm for these purposes. We will be establishing a system of plots to monitor spruce budworm populations throughout the U.P. in the not too distant future.)

Shingleton Reforestation Trials: Prescribed Burn for Removing Lichen, *Cladonia sp.*, From Planting Sites

The purpose of this project was to determine the feasibility of reforesting portions of an expansive area (approximately 75 sections of land) which once grew large white pine. Clear cutting followed by fire near the turn of the century removed much of the humus so important to the sandy soils typical of these area (e.g., Rubicon sands). Over time, these areas developed ground covers of grass, lichens, and other low growing vegetation. One factor hindering efforts to reforest these areas may well be the presence of dense lichen matts.

Lichens intercept and prevent moisture from entering the soil. Soil moisture is a critical limiting factor on these deep, sandy soils. A study by Porter and Wallet reports 212 times more water available in open areas compared to soil covered by *Cladonia*. Lichen is also suspected of allelopathic suppression of mycorrhizae. In our search for effective methods of reducing the lichen ground cover, we tried a prescribed burn in the Spring, 1984.

In June, 1984, two 0.6 acre patches with dense lichen matts were burned. It had been an unusually dry spring. On the day of the burn, there were 20 mph winds out of the southeast. The temperature was 75°F with 41% relative humidity under partly cloudy skies. The grass on site was still primarily brown, but scattered blueberry patches had leafed out.

The plots were burned slowly into the wind by igniting the entire north side of the rectangular plots. The lichens within the plots were successfully removed. We will

evaluate these sites in following years to see how long it takes for lichen and other plants to re-invade the plots. We will plant replicated blocks of containerized red and jack pine in the burned acres and adjacent unburned areas. As stated in the mycorrhizal research report, this planting will also include seedlings innoculated and not innoculated with a native mycorrhizae, *Scleroderma aurantuim*, to test the difference in mycorrhizae establishment with and without lichen matts. This will also be the initial out planting of innoculated seedlings, testing the success of the innoculation procedures and the fungus when reintroduced to a field situation after laboratory isolation and culturing.

Aspen Management for Timber and Wildlife Values

We are currently searching for an efficient procedure to practice plus clone aspen management. Our thoughts to date are to identify heritable characteristics to select against when managing aspen. Features such as susceptibility to Hypoxylon Canker, limbiness of the lower bole, and poor stem form will be selected against. With these traits in mind, stand inventory examiners can identify aspen stands which include obviously inferior clones.

Most of our aspen resource is mature to over-mature. Thus, our current approach would be to mark inferior clones for leaving when the stand is harvested. A buffer strip on the clone perimeter may be herbicided to discourage spreading of the clones into the harvested area. Thus, the inferior clones would be left to mature and die naturally, or could be herbicided at a later date to create openings after the regenerated stand is well established. The surrounding superior aspen would then eventually invade the area.

Both forestry and wildlife values would be served by plus clone selection. We would increase the quality and yield of the aspen resource for future generations, and increase the wildlife carrying capacity of the aspen stands for species such as ruffed grouse by interspersing older and younger age clones.

Oak Wilt Control Program, Menominee County

The oak wilt control effort in the Shakey Lakes Area of Menominee County progressed another step this summer. Last year's herbicide treatments to create dead tree barriers to root graft transmission were unsuccessful. The herbicides did not kill the trees below the girdling. Thus, we are not satisfied that root graft transmission of oak wilt will not occur through these living root systems.

In view of this, we began creating root graft barriers with a vibratory plow (48" blade) this summer. Eighteen of the 27 detected epicenters were treated. Two lines were plowed around half of the treated epicenters and the other half had single lines.

The interior line, if successful, will minimize tree loss due to its close placement. The closer the line to the disease front, the better the chance that all potentially disease trees within the perimeter will die before they can re-establish root grafts across the plow line. The exterior line is an insurance line in case the first row of apparently healthy trees include diseased trees without symptom development this year.

Funding constraints dictated that several epicenters receive only one line, thus allowing more epicenters to be treated. This is not all bad. We would like to obtain a 60" plow blade for next year's treatments. This has a much better success record in disrupting all potential root graft barriers. The nine remaining untreated epicenters and any escapees from this year's control lines will be treated next year.

A positive effect of last year's herbicide treatments was the prevention of pressure pad development on most herbicided wilting trees. Apparently the trees died quickly and dried enough before winter to prevent pressure pad development. Thus, random transmission by sap beetles was greatly reduced. Because of this, this year's wilting trees were herbicided in the fall.

We hope to mount a full scale program against oak wilt for the next two to three years. We plan to contract complete aerial photo coverage of the area next July to insure all epicenters are detected. Michigan Technological University, the Michigan Department of Agriculture, the M.S.U. Cooperative Extension Service and the Michigan Department of Natural Resources are cooperating to control the oak wilt. We feel we have an excellent opportunity to eliminate oak wilt from this valuable oak resource.

PROJECTS

Mycorrhizae Research (J. Bruhn, M.T.U.)

Significant advances were realized in 1984 in the study of potentially beneficial mycorrhizal fungi native to the U.P. A fungi *Scleroderma aurantuim* collected in association with red pine in the Danaher Plains was isolated in pure culture. The innoculum successfully promoted mycorrhizal structures on pine seedling roots in the green house. These mycorrhizal structures appear to be distinctive, so we can identify them in the field without relying on the presence of fruiting structures (e.g., mushrooms, or in this case a puffball). Other fungi have also been collected both on jack pine and red pine. Scleroderma looks especially promising because of its potentially wide host range (jack and red pine, and perhaps larches), and its presence on many diverse sites throughout the U.P.

A recent boost to this program has been Mead Corporation's involvement in mycorrhizae research. They have funded Dr. Bruhn to study and develop innoculation procedures in their greenhouse operations using native mycorrhizal fungi. Bruhn will evaluate seedling response as correlated to presence of mycorrhizal associations resulting from greenhouse innoculation. *Scleroderma aurantuim* will initially be tested on red and jack pine containerized stock.

As part of an ongoing project entitled the Shingleton Reforestation Trials, we will plant red and jack pine seedlings in the Kingston Plains northeast of Kingston Lake in the fall, 1985. Innoculated and uninnoculated containerized red and jack pine will be planted in areas which have and have not had the heavy lichen matts reduced via a prescribed burn in 1984. Lichen presence is suspected to inhibit mycorrhizal associations and lichens are moisture demanding plants.

DIVISION PESTICIDE POLICY
(R. Heyd, DNR)

A Forest Division Policy governing the use and storage of pesticides has recently been approved. As part of this policy, a pesticide application plan will be required which records the essential criteria for making a pesticide prescription. After a pesticide application is completed, a pesticide use evaluation report will be required which will document the results of the application. For herbicides, the use-evaluations are completed in the second year after treatment. District Silvaculturalists will play a major role in these evaluations.

As forest management efforts intensify, we need increasingly to weigh the costs and benefits of forest management options. Thus, it is important that we closely evaluate--via record keeping--the results of our pesticide applications.

GYPSY MOTH MANAGEMENT PROGRAM
(M. Hanna, MDA)

The Michigan Department of Agriculture cooperates with the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, and the USDA Forest Service to manage the gypsy moth in Michigan.

Each year, the state traps for gypsy moth to detect new infestations outside of the infested counties and to delimit previously isolated finds. In 1984, 15,017 traps were set. Of the areas where gypsy moth was found, no counties were to be treated.

During the summer, the MDA monitored gypsy moth populations to see what the populations do under normal circumstances. The management program included a pheromone trap survey and the release of exotic parasites. In 1985, alternatives for controlling gypsy moth will be evaluated for possible use in the program.

RESEARCH BY THE NORTH CENTRAL FOREST EXPERIMENT STATION
(L. Wilson, U.S. Forest Service)

Research began in 1984 on the genetic distance/closeness between three species of cone beetles in the Midwest: red pine, white pine, and the jack pine tip beetle. Using the analytical tool of gel electrophoresis, we found that red and white pine cone beetles are distinct species. However, so far, the red

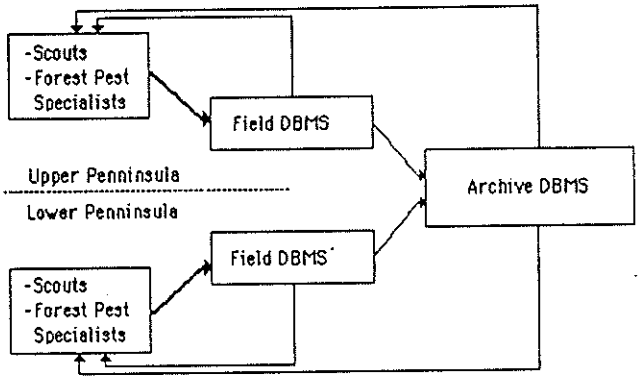
pine cone beetle and the jack pine tip beetle are so similar that we cannot separate them. Future research will continue to look for differences between these latter two species to confirm the species status of the tip beetle.

Research on insects attacking hybrid *Populus* clones showed that the tarnished plant bug was the worst nursery pest on *Populus* in 1984. It attacked a wide variety of clones but highly preferred a clone called *Populus euramericana* 'Wisconsin 5.' The insect attacked 82 percent of this clone and caused lesions on the stems. Stems with lesions often break over or grow crooked at the injury.

Research in 1985 will concentrate on a new midge on honey locust described in 1984 as *Neolasioptera brevis* Gagne. It forms galls on the shoots which cause shoot breakage and deforms new growth.

FOREST PEST MANAGEMENT INFORMATION SYSTEM
(F. J. Sapio and G. A. Simmons, MSU)

During the 1985 field season, a new system to manage data collected by DNR and MSU personnel will be implemented in both the Roscommon and Marquette regional offices. Data collected by specialists and scouts is stored and managed by a microcomputer in each regional office using a relational data base management system. At the end of each field season, data will be exported to another management system housed by the Department of Entomology at Michigan State University. This system is compatible with previous CCMS data and essentially has been developed as the CCMS forestry component. Data input at the field level is forms-driven so that scouts can input data with a minimal amount of training. Currently, data put into the system falls into two categories: information concerning DNR-forest management plantations and long-term management plots. Pest survey information as well as information concerning plantation management, survival, growth, planting history, location, etc., is stored both in the field and archive. Information in the archive is linked to a statistical analysis system so that managers and researchers can begin to answer some forest management questions that can only be addressed with long term data collection. Future plans include the linkage of a geographic information system (GIS) for color map display and the spatial analysis of data as well as a sister system for private landholdings.



Basic information flow of the Michigan Cooperative Forest Pest Management Programs Forest Pest Management Information System.

1984 GYPSY MOTH PARASITOID WORK
(R. J. Priest, MDA)

Ooencyrtus kuvanae Howard, an egg parasitoid, has been released at several locations in central Michigan. Release sites were monitored this year to confirm its establishment. All release sites except one produced *Ooencyrtus* from collected gypsy moth egg masses. This species is now found in Gratiot, Isabella, and Midland counties. It had increased sufficiently that collection of enough parasitized egg masses was possible to make releases at three new sites. Observation of adults at these sites confirmed their initial presence. The exposed egg masses were collected and destroyed by early winter.

McPhail traps were set out to detect the presence and seasonal appearance of *Compsilura concinnata* Meigen. This tachinid fly parasitizes midinstar larvae. It has never been released in Michigan though it was recovered during baseline data collection of gypsy moth parasitoids in 1974. This year traps baited with Torula yeast were used and serviced weekly. Examination of these

returns has not yet been completed. From previous larval host rearings it appears that this fly has three distinct generations in mid-Michigan.

Trapping was continued again this year for *Rogas lymantriae* Watanabe. This early instar, double brooded parasitoid, was released last year in Gratiot county. Detection of this species was attempted by placing burlap bands in the release area. These tree bands were checked periodically throughout the season for mummified caterpillars. No mummies were recovered this year of either gypsy moth or its likely alternate host the whitemarked tussock moth.